Applicant believes the foregoing amendment complies with requirements of form and thus may be admitted under 37 C.F.R. § 1.116(a). Alternatively, if this amendment is deemed to touch the merits, admission is requested under 37 C.F.R. § 1.116(b). In this connection, the amendment was not earlier presented because it is in response to the matters pointed out for the first time in the Final Office Action.

The Examiner objects to the drawings under 37 C.F.R. 1.83(a) for failure to show every feature of the invention specified in the claims. Applicant proposes to amend FIG. 3 of the application to address the Examiner's objection. Specifically, applicant proposes to add a "Gamma Correction Circuit" box within the RGB driver processing circuit 70 shown in FIG. 3. This addition is adequately supported by the first full paragraph on page 20, lines 9-16 of the present application. Thus, applicant respectfully submits that no new matter is entered by this amendment.

The Examiner rejects claims 1 and 5 as anticipated by U.S. Patent No. 6,144,353 to McKnight. The Examiner rejects claims 3-4 and 7-17 as obvious over the McKnight patent in view of U.S. Patent No. 6,078,317 to Sawada. All rejections are hereby respectfully traversed. Applicant submits that all pending claims are in condition for allowance.

The present application describes a color LCD device, such as an electrically controlled birefringence (ECB) LCD, having an LCD panel 50 and a driving circuit 60 coupled to the LCD panel 50. The driving circuit 60 receives an input video signal to generate R, G, and B driving signals for driving display pixels of the LCD panel 50. FIG. 4 of the present application shows the relationship between the driving voltage and the transmittance for the R, G, and B light components in the LCD panel. As shown in FIG. 4, the peak transmittance of the R, G, and B light in the LCD panel are occurred at the driving voltages of approximately 8V, 7V, and 5V, respectively. Accordingly, to more precisely display white light in the LCD panel, voltages of the R, G, and B driving signals should be independently set at approximately 8V, 7V, and 5V, respectively. See Application, FIG. 4, page 19, line 4-page 20, line 16.

In a preferred embodiment of the present invention, the driving circuit 60 includes a RGB driving processing circuit 70 for outputting the R, G, and B driving signals to the LCD panel 50. The RGB driving processing circuit 70 has a limit level generation circuit 84 for generating a pair of voltage level control signals (d) and (e) respectively for setting the lower limit of the OFF voltage and the upper limit of the ON voltage, resulting a waveform of each driving signal shown in (c) of FIG. 7. According to the present application, voltages of the driving signals respectively for R, G, and B displays, each with a waveform similar to the (c) of FIG. 7, can be ***independently*** set to provide the optimum transmittance of the R, G, and B light components. See Application, page 26, line 25-page 27, line 17. As a result, the presently described LCD device can achieve a more preferable color display over a conventional LCD device.

The McKnight patent, on the other hand, describes a display system for modulating a control electrode to cause an electro-optic layer to be reset to a state in which display data is ***not viewable***. According to the McKnight patent, the display system displays the first image and then applies a first control voltage to the electrode to alter a state of the electro-optic layer such that the first image is substantially not displayed and then the display system displays a second image represented by a second plurality of pixel data values after the electrode receives a second control voltage. In other words, the LCD described in the McKnight patent modulates the control voltage (e.g., ***the relative voltage between the common electrode and a pixel electrode***) to achieve a high frame-to-frame independence, high contrast, and high brightness of its LCD. The control voltage is ramped up over V_B during the frame switching state of the pixel electrode. See col. 9, lines 44-67 of the McKnight patent. As a result, its LCD displays "dark" when the control voltage is over V_B even though the pixel data on the pixel electrode is still present or is being changed during frame changing. FIG. 2C of the McKnight patent shows time graphs respectively of a control voltage applied to ***the control electrode (i.e., the common electrode)*** and the ***light intensity*** of the pixels in the liquid crystal display. See col. 10, lines 1-50 of the McKnight patent. In FIG. 2C, the control

voltage waveform 151 is applied to the control electrode and the light intensity waveform 152 of the LCD shows pixel intensity curves 153-156 at different time periods of the time graph. These pixel intensity curves 153-156, however, are merely ***light intensity waveform*** displayed on pixels of the LCD. They do not describe anything about the ***driving voltages, which are totally different from the displayed light intensity of the LCD,*** respectively for the R, G, and B display electrodes for the LCD, as described in the present application.

The Sawada patent describes a display control apparatus for display of an image by receiving an RGB video signal and vertical and horizontal synchronizing signals. According to the Sawada patent, the display control apparatus includes an interpolation processing circuit 16 to expand the image defined by the RGB image data in the vertical direction in correspondence with the display mode. Similar to the McKnight patent, the Sawada patent nevertheless does not describe the driving voltages respectively for the R, G, and B display for the LCD device. Nor does the Sawada patent describe independently determining the upper limit values respectively of the R, G, and B signal driving voltages to achieve the largest transmittance of the R, G, and B light components displayed in the LCD device.

In the Final Office Action, the Examiner stated that "figure 2C (of the McKnight patent) indicates the intensity R/G/B display at t2, t4 and t6, and control voltages of common electrode Vcg ... Note the corresponding one-to-one relationship between driving voltage and intensity as illustrated in figure 2B and note the separate display of R light, G light, B light in figure 2C." Applicant respectfully submits that the Examiner apparently misinterprets the McKnight patent in several aspects.

Firstly, the driving voltage waveform 151 shown in FIG. 2C of the McKnight patent is referred to ***the control voltage*** V_{CG} applied on the control electrode (i.e., the common electrode 26) of the LCD. The control voltage V_{CG}, thus, is with respect to all pixel electrodes of the LCD, and it does not refer to ***the driving voltage*** for the TFT transistor of any particular pixel electrode (e.g., the R-color electrode, the G-color electrode, or the B-color electrode).

Secondly, the McKnight's control voltage V_{CG} is modulated to control pixel electrodes of the LCD to be viewable (white) or not viewable (dark), thereby increasing the frame-to-frame independence or contrast of the LCD (see FIGS. 2B-C, col. 9, line 44-col. 10, line 50). The McKnight patent does not describe or suggest that the control voltage V_{CG} has anything to do with independently setting different ***driving voltages*** respectively for the R display electrodes, the G display electrodes, and the B display electrodes.

Thirdly, the waveform 152 (which includes sub-waveforms 153-156) as shown in FIG. 2C is the ***light display intensity*** of a particular pixel electrode in response to the voltage waveform of the control voltage V_{CG} 151. The light intensity waveform 152 represents the pixel electrode's light intensity such as the intensity of the "white" light, the R color, the G color, or the B color. These waveforms 153-156, however, may well represent the same color, e.g., the white light, of different intensity. Nowhere in the McKnight patent does it describe a one-to-one correspondence respectively between the waveforms 154-156 and the R/G/B display, as suggested by the Examiner. As a result, applicant respectfully submits that it is incorrect to assert that waveforms 154, 155, and 156 respectively associate with R display, G display, and B display in the LCD.

Fourthly, as mentioned above, the waveforms 154-156 represent the light display intensity of the pixel electrode. These waveforms 154-156 are not the R/G/B driving voltage waveforms respectively for driving pixel electrodes to display the R color, G color, and B color. Lastly, the McKnight patent does not describe or suggest ***independently setting*** the upper limit of the driving voltage for the R color signal, the G color signal, and the B color signal, thereby improving the LCD's light transmission and display quality respectively for different colors. Accordingly, the present application distinguishes over the McKnight patent.

Claim 1 of the present application recites, in pertinent part, "each of upper limit values of ranges for driving voltages respectively for R display, G display, and B display applied to the liquid crystal is set independently for R light, G light, and B light." As discussed, the McKnight patent does not describe this limitation of

claim 1. Thus, claim 1 distinguishes over the McKnight patent and is in condition for allowance.

Claims 3-4 depend on claim 1. As discussed, neither the McKnight patent nor the Sawada patent describes the above-mentioned limitation of claim 1. Thus, claims 3-4 distinguish over the McKnight patent and the Sawada patent and are in condition for allowance.

Claim 5 recites, in pertinent part, "each of upper limit values of ranges for driving voltages respectively for R display, G display, and B display applied to the liquid crystal is set independently for R light, G light, and B light." As discussed, the McKnight patent does not describe this limitation of claim 5. Thus, claim 5 distinguishes over the McKnight patent and is in condition for allowance.

Claims 7-8 depend on claim 5. As discussed, neither the McKnight patent nor the Sawada patent describes the above-mentioned limitation of claim 5. Thus, claims 7-8 distinguish over the McKnight patent and the Sawada patent and are in condition for allowance.

Claim 9 depends on claim 1. Thus, claim 9 distinguishes over the McKnight patent and the Sawada patent and is in condition for allowance.

Claim 10 recites, in pertinent part, "each of upper limit values of ranges for driving voltages for application to the liquid crystal is set independently for each of R, G, and B light, and the maximum difference among the set voltages stays within 20%." As discussed, neither the McKnight patent nor the Sawada patent describes this limitation of claim 10. Thus, claim 10 distinguishes over the McKnight patent and the Sawada patent and is in condition for allowance.

Claim 11 recites, in pertinent part, "each of upper limit values for defining the maximum light transmittance of the liquid crystal, of ranges of driving voltages applied to said liquid crystal, is set independently for each of R, G, and B light." As discussed, neither the McKnight patent nor the Sawada patent describes this limitation of claim 11. Thus, claim 11 distinguishes over the McKnight patent and the Sawada patent and is in condition for allowance.

Claim 12 depends on claim 11. Thus, claim 12 distinguishes over the McKnight patent and the Sawada patent and is similarly in condition for allowance.

Claim 13 recites, in pertinent part, "each of upper limit values of ranges for driving voltages respectively for said R, G, and B driving signals applied to said pixel electrodes is set independently for R, G, and B light." As discussed, neither the McKnight patent nor the Sawada patent describes this limitation of claim 13. Thus, claim 13 distinguishes over the McKnight patent and the Sawada patent and is in condition for allowance.

Claims 14-15 depend on claim 13. Thus, claims 14-15 distinguish over the McKnight patent and the Sawada patent and are similarly in condition for allowance.

Claim 16 recites, in pertinent part, "each of upper limit values of ranges for driving voltages for R display, G display, and B display applied to said liquid crystal by said transparent electrode and said reflection electrode is set independently for R, G, and B light." As discussed, neither the McKnight patent nor the Sawada patent describes this limitation of claim 16. Thus, claim 16 distinguishes over the McKnight patent and the Sawada patent and is in condition for allowance.

Claim 17 depends on claim 16. Thus, claim 17 distinguishes over the McKnight patent and the Sawada patent and is similarly in condition for allowance.

The art made of record but not relied upon by the Examiner has been considered. However, it is submitted that this art neither describes nor suggests the presently claimed invention.

Applicant believes the foregoing amendments place the application in condition for allowance and early, favorable action is respectfully solicited.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los Angeles telephone number (213) 337-6870 to discuss the steps necessary for placing the application in condition for allowance.

If there are any fees due in connection with the filing of this response, please charge the fees to our Deposit Account No. 50-1314.

Respectfully submitted,

HOGAN & HARTSON L.L.P.

Date: December 19, 2001

By: _____

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Enclosures: Drawing Amendment
Red-marked Figure 3
IDS/Form 1449/1 reference